Kirramyces destructans sp. nov., a serious leaf pathogen of *Eucalyptus* in Indonesia

Michael J. Wingfield,* Pedro W. Crous[1] and David Boden[2]

*Tree Pathology Cooperative Programme, Department of Microbiology and Biochemistry, University of the Orange Free State, P.O. Box 339, Bloemfontein, 9300 Republic of South Africa

[1]Department of Plant Pathology, University of Stellenbosch, Private Bag X1, Matieland, 7602 Republic of South Africa

[2]P.T. Inti Indorayon Utama, RGM Forestry Services, Medan 20231, Indonesia

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A number of *Kirramyces* J. Walker *et al.* species, formerly accommodated in the genus *Phaeoseptoria* Speg., are pathogens of *Eucalyptus* L' Hérit. spp. A new species, *K. destructans* M.J. Wingf. & Crous sp. nov., associated with a leaf blight disease in Northern Sumatra, Indonesia, is described. This disease is most common on leaves of *E. grandis* Hill: Maid., but has also been observed on other *Eucalyptus* spp.

Keywords: *Euclayptus, Kirramyces destructans*, systematics.

*To whom correspondence should be addressed.

Introduction

Species of *Eucalyptus* L' Hérit. are being propagated extensively as exotics in plantations in many parts of the world and form the basis of important paper and pulp, as well as timber industries. These trees are largely separated from their natural enemies and are also exposed to new pests and diseases, native to the countries where they are now propagated (Ferreira 1989; Wingfield 1990; Sankaran *et al.* 1995). Serious disease problems have already emerged in some areas, and it is reasonable to expect that this is a trend that will continue in the future (Wingfield 1990).

A remarkably wide range of fungi is known to infect *Eucalyptus* leaves (Gibson 1975; Sankaran *et al.* 1995). Only a small number of these, however, are pathogens that have a serious impact on tree growth. Amongst the more important ones are various species of *Mycosphaerella* Johanson (Park & Keane 1982, 1984; Crous & Wingfield 1996), *Cylindrocladium* Morgan (Crous & Wingfield 1994), and *Eucalyptus* rust caused by *Puccinia psidii* G. Winter, which also infects shoots and small branches (Ferreira 1989).

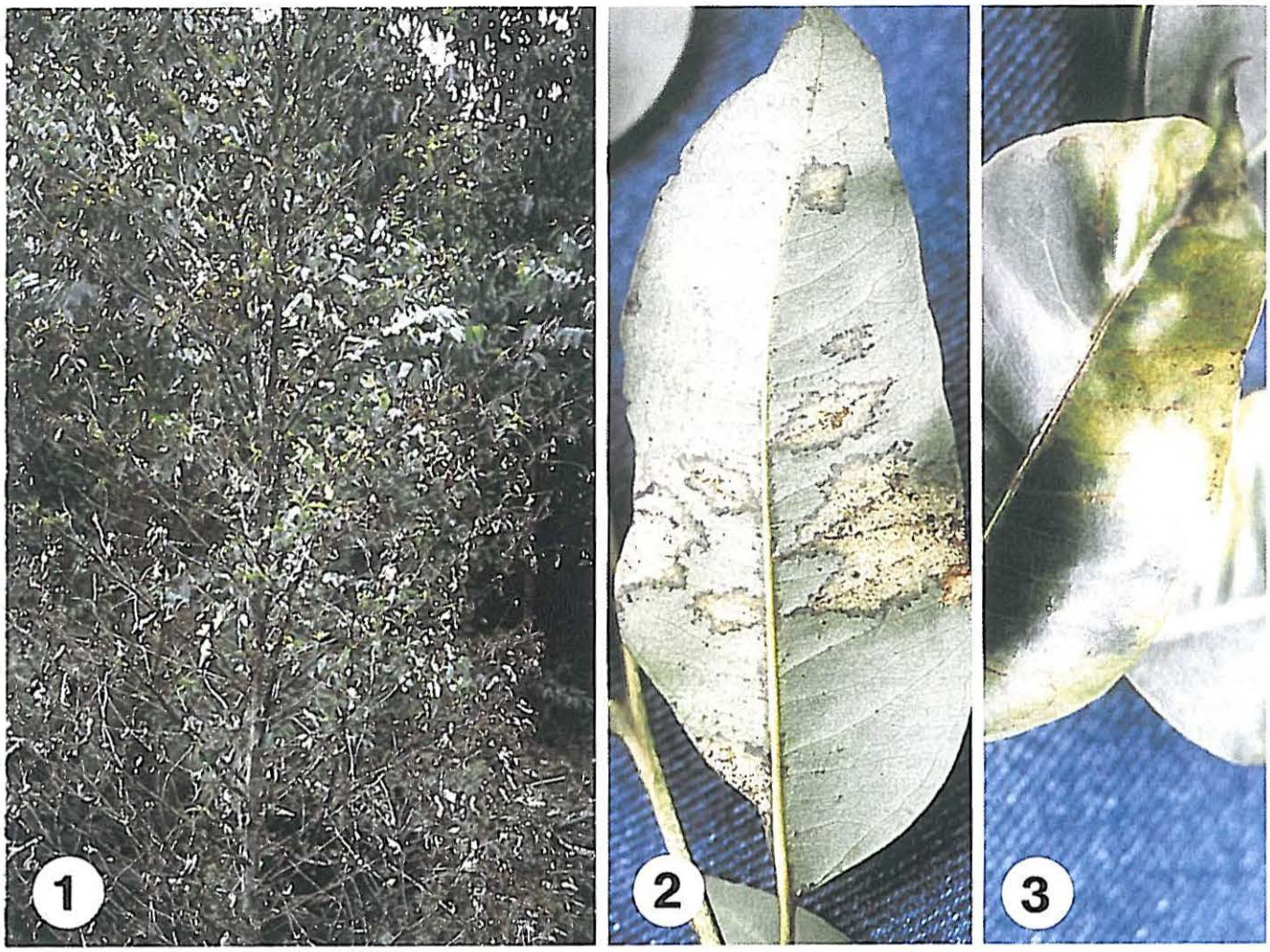
The genus *Kirramyces* J. Walker *et al.* was established for foliicolous pathogenic coelomycetes in the *Phaeoseptoria*-like complex (Walker *et al.* 1992). Species with pigmented, distoseptate conidia and smooth, annellidic conidiogenous cells were placed in *Sonderhenia* Swart & J. Walker. Others, with pigmented, euseptate, verruculose, cylindrical to obclavate conidia, and pigmented, verruculose, percurrently proliferating conidiogenous cells, were accommodated in *Kirramyces*. Presently, three species of *Kirramyces* have been described from *Eucalyptus* (Walker *et al.* 1992), one from *Protea* L. (Sutton 1993), one from *Phormium* J.R Forster & G. Forster (Palm 1996) and one from *Hebe* Comm ex Juss. (Wu *et al.* 1996).

Walker *et al.* (1992) noted that there are several additional species of *Kirramyces* on *Eucalyptus* that await taxonomic treatment. Of the species presently known from *Eucalyptus*, our Indonesian collection must be compared with *K. epicoccoides* (Cooke & Massee) J. Walker *et al.*, *K. eucalypti* (Cooke & Massee) J. Walker *et al.* and *K. lilianiae* J. Walker *et al.* Of these taxa, *Kirramyces destructans* is most similar to *K. eucalypti* (conidia 25–48 × 2–3 μm, 0–2-septate) and *K. lilianae* (conidia 35–50 × 16 (–7) μm, 1–3-septate). In conidial shape, it is distinct from *K. lilianiae*, but similar to *K. eucalypti*. It can, however, be distinguished from both species by having longer, variously curved, (1–)3-septate conidia, (30–)50–65(–70) × 2.5(–3) μm. The Indonesian collection from *Eucalyptus* is, therefore, newly described as follows:

Kirramyces destructans *Wingfield & Crous* sp. nov., Figures 1–4

Maculae folii irregulares vel subcirculares, 10–20 mm diam., aut urentes areas magnas laminae, pallide brunneae ambobus in superficiebus, limbus diffiusus, margo rufobrunnea si praesens est. Indicia variant ab uredine surculi usque ad maculas folii magnas subcirculares vel folii uredinem. Mycelium internum, pallide brunneum, septatum, ramosum, laeve, 2–3.5 μm diam. Conidiomata pycnidiolia, hypogena, substomatalia, sparsa, atra, globosa vel subglobosa, unilocularia, 50–150 μm alta, 50–130 μm diam.; paries texturae angularis constans ex 2–3 stratis cellarum brunnearum. Ostiolum singulare, centrale, exigue papillatescente in pycnidiis maturis. Conidiophora reducta usque cellas conidiogenas. Cellae conidiogenae discretae, pallide brunneae, doliiformes vel subcylindricae, verruculosae, 1–3 proliferationibus percurrentibus, 4–6 × 5–7.5 μm. Conidia holoblastica, solitaria, sicca, exsudantia in cirris longis, formantia masses atras in folii superficie, cylindrica, apex obtusus, vel exigue angustatus a septo apicali usque apicem subacutum ut inventum in *K. eucalypti*; basis truncata, 1.5–2 μm lata, raro segmento minuto marginali; varie curvata, raro recta, crassitunicata, pallide brunnea, verruculosa, guttulata, (1–)3-euseptata, (30–)50–65(–70) × 2.5(–3) μm.

Leaf spots irregular to subcircular, 10–20 mm diam., or blighting large areas of the lamina, light brown on both surfaces, border diffuse, margin red-brown when present. Symptoms vary from shoot blight to large subcircular leaf spots or leaf blight. Mycelium internal, pale brown, septate, branched, smooth, 2–3.5 μm diam. Conidiomata pycnidial, hypogenous, substomatal, scattered, black, globose to subglobose, unilocular, 50–150 μm high, 50–130 μm diam.; wall of *textura angularis*, consisting of 2–3 layers of brown cells. Ostiole single, central, becoming slightly papillate in mature pycnidia. Conidiophores reduced to conidiogenous cells. Conidiogenous cells discrete, pale brown, doliiform to subcylindrical, verruculose, with 1–3 enteroblastic, percurrent proliferations, 4–6 × 5–7.5 μm. Conidia holoblastic, solitary, dry, exuding in long cirri, forming black masses on the leaf surface, cylindrical, apex obtuse, or tapering slightly from its apical septum to a subacute apex as found in *K. eucalypti*; base truncate, 1.5–2 μm wide, minute marginal frill mostly absent; variously curved, rarely straight, thick-walled, light brown, verruculose, guttulate, (1–)3-euseptate, (30–)50–65(–70) × 2.5(–3) μm.



Figures 1–3 Leaf symptoms associated with *Kirramyces destructans*. **1.** A young *E. grandis* tree with severe defoliation. **2.** Initial water-soaked symptoms on the abaxial leaf surface. **3.** Chlorosis visible on the adaxial leaf surface of newly infected leaves.

Specimens examined. Holotype: Aek Nauli, Lake Toba area, Northern Sumatra, Indonesia, living leaves of *Eucalyptus grandis*, M.J. Wingfield, Feb. 1996, PREM 54416. Paratypes: Sabisa, Sumatra, Indonesia, living leaves of *E. grandis*, M.J. Wingfield, Feb. 1996, PREM 54688; Aek Nauli, Lake Toba area, Northern Sumatra, Indonesia, living leaves of *E. grandis*, M.J. Wingfield, Feb. 1996, PREM 54689; Taratung, Indonesia, living leaves of *Eucalyphus grandis*, M.J. Wingfield, Feb. 1996, PREM 54690; Habinsarin, Northern Sumatra, Indonesia, living leaves of *E. grandis*, M.J. Wingfield, Feb. 1996, PREM 54691.

Kirramyces destructans, which has been collected from a few unidentified *Eucalyptus* spp., appears to be a particularly virulent pathogen of young (1–3-year-old) *E. grandis* Hill ex Maid. trees in Northern Sumatra. Infections occur on young leaves and even in unopened shoots. Infected leaves are often malformed, and on older leaves, the veins commonly display a purple discolouration. On heavily infected leaves, most stomata are individually infected, and under moist conditions, masses of black conidia are found on the undersurface of these leaves.

The leaf blight disease associated with *K. destructans* has not been recorded outside Sumatra. Given the fact that *Eucalyptus* is not native to the area, it seems probable that this pathogen has been introduced, either from Australia or other parts of Indonesia where *Eucalyptus* is native. Alternatively, it is possible that the fungus originated from native Myrtaceae in Sumatra. In their description of the genus *Kirramyces*, Walker *et al.* (1992) noted that they were aware of a number of undescribed taxa on *Eucalyptus*, but suggested that additional surveys were required to clarify this situation. It would be interesting to compare *K. destructans* with new collections from Australia.

Kirramyces epicoccoides is a well-known pathogen of *Eucalyptus* and has been recorded from most parts of the world where these trees are propagated (Crous *et al.* 1988; Walker *et al.* 1992; Sankaran *et al.* 1995). This fungus is generally of minor importance in that it occurs on older leaves or leaves on stressed trees (Nichol *et al.* 1992a, b). In this regard, *K. destructans* is apparently unusual in that it is a destructive pathogen of actively growing tissue. *K. epicoccoides* is common on trees damaged by *K. destructans* and can even be found on the same leaves. The discrete purple-coloured lesions associated with *K. epicoccoides* are, however, quite distinct from those associated with *K. destructans*, and the presence of these two related fungi can usually be determined prior to light microscopy.

Diseased leaves, buds and young shoots collected in Indonesia suggest that *K. destructans* is a highly virulent pathogen. However, as no inoculations have been done with this pathogen to date, very little is known of its biology and potential importance to the forestry industry. There is clearly an urgent need for detailed studies of the biology of this fungus, including determination of host range and conditions favouring infection.

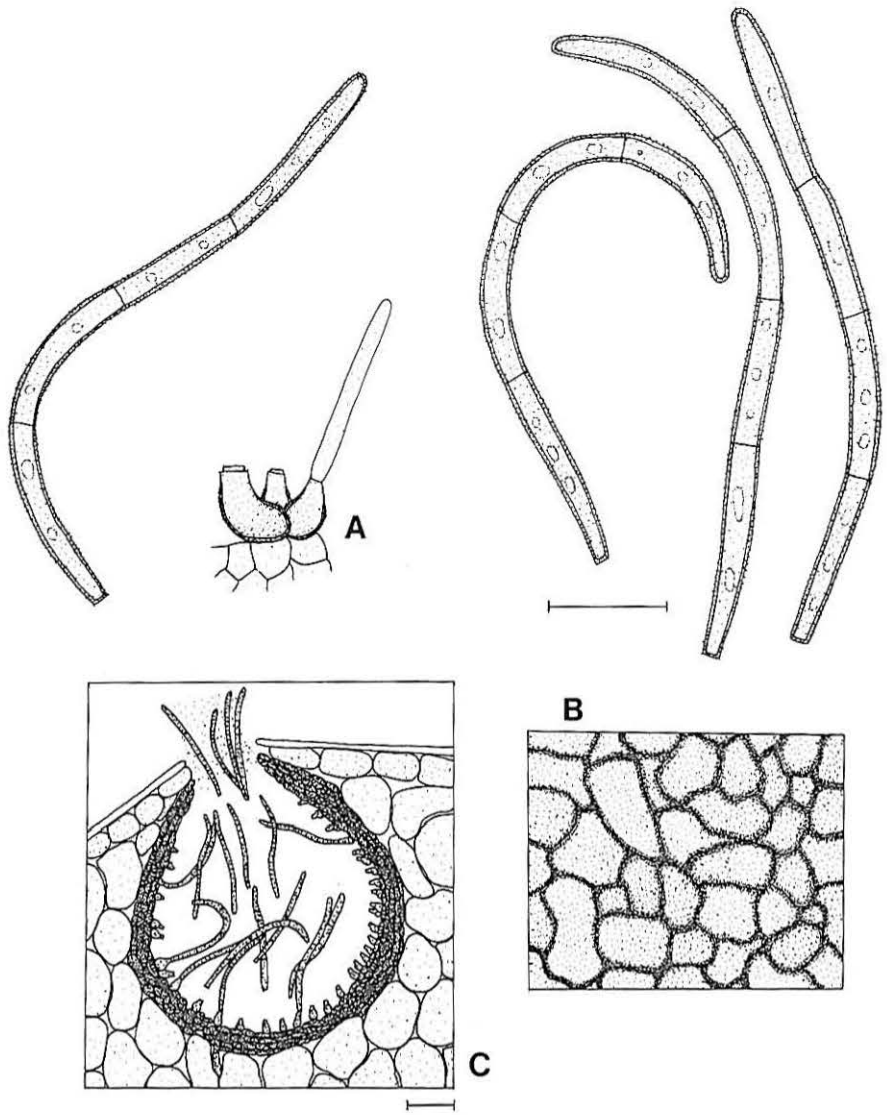


Figure 4 *Kirramyces destructans*. A. Conidia and percurrently proliferating conidiogenous cells. B. Outer wall layer of a pycnidium. C. Vertical section through a pycnidium. (Scale bar: 10 μm.)

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